## SEMINARS ON THE NEW LIFE CONTINGENCIES BOOK

The Society has announced seminars this March on the new life contingencies material, especially for Part 4 students though others are welcome. These will be in many cities, and are likely to be offered in yet other places in August. Attendance fee is US$ 100., not including meals and accommodation. Minimum attendance is 10 persons.

Other locations will be considered if those requesting them will guarantee 10 or more registrations.

## HOW TO BUY "ACTUARIAL MATHEMATICS"

The Society's new life contingencies textbook can now be purchased, but only piecemeal. Buyers should choose which one or more of the following they want:

1. The Preface and Chapters 3-10, the book's core, are in a Part 4 study note. Price $23.00.

2. Chapters 1, 2, 11 12 and 13 are in *Risk Theory*, the Part 5 study note identified as 52-1-82. Price $10.50.

3. Chapters 14 and 15, treating expenses and nonforfeiture benefits, are bound separately in what will be a Part 4 study note. Price $9.00.

4. Bound specially for Part 4 students are the book's Preface and Chapters 1 and 2. This duplicates portions of 1. and 2. above.

Prices are US$, prepaid. Order from Society office.

The whole book, hardbound, will appear in 1985. It is sure to contain corrections, pointed out by students, of typographical errors, notational inconsistencies and unsolvable exercises.

## Actuarial History Books

Thomas Simpson: The doctrine of annuities and reversions. London, 1742.

This is an inadequate catalogue of the wealth of material available from this source. For a complete list, apply to Dr. Edward Gray, Director, Pergamon Press, Inc., Fairview Park, Elmsford, NY 10523.

*E.J.M.*

## MOVING ON

*by Beda Chan*

In this note, we show that the Society's advice for multiple choice examination of *move on, seriously attempt each question but do not spend a disproportionate amount of time on a single question* (Society of Actuaries 1984 Examinations, p. 19) is indeed wise and sound.

Consider Part 1 examination (3 hours, 60 questions) as an illustration. Assume that 30 correct choices and 30 omits are needed to pass. With good accuracy, this can be attained by answering 35 questions, expecting 31 corrects and 4 incorrects. A candidate averages 6 minutes per question, thus answers 30 questions in 3 hours. We interpret the Society's advice in the following mathematical table.

### Basic Model

Each question needs to be seriously screened for S minutes. After screening, the working time W needed to work out the question is then known. Total time T for the question is thus $T = S + W$.

We assume that random variables S and W have exponential distributions with $E(S) = 1/\lambda$, $E(W) = 1/\beta$. Given $E(T) = 1/\lambda + 1/\beta = 6$. We interpret the Society's advice as the following approach to improve speed.

### Move On if $W > \tau$

That is, after spending S with a question and W is then known, do not work out the question and go to the next if $W > \tau$. Expected working time will decrease to

$$E(W|W \leq \tau) = \frac{\int_0^\tau w\beta e^{-\beta w}dw}{\int_0^\tau \beta e^{-\beta w}dw} = \frac{1}{\beta}\left[1 - \frac{\beta\tau e^{-\beta\tau}}{1 - e^{-\beta\tau}}\right].$$

Since not every question screened will be worked out, expected screening time per question worked out will increase to $\frac{1}{\lambda}\left[\frac{1}{1 - e^{-\beta\tau}}\right].$

The best $\tau$ that minimizes the expected total time per worked question

$$\phi(\tau) = \frac{1}{\lambda}\left[\frac{1}{1 - e^{-\beta\tau}}\right] + \frac{1}{\beta}\left[1 - \frac{\beta\tau e^{-\beta\tau}}{1 - e^{-\beta\tau}}\right]$$

is found by solving $\frac{d\phi}{d\tau} = 0$, which simplifies to $\frac{1}{\lambda} + \frac{1}{\beta} = \tau + e^{-\beta\tau}$.

There is no analytical solution to this equation; the value of $\tau$ must be found by numerical methods. (See, e.g., Burden, R. L., Faires, J. D., and Reynolds, A. C., Numerical Analysis, 2nd ed., PWS Publishers, 1981, pp. 34-38.)

The first block in the table below says that with a speed of 6 minutes per question, the part 1 candidate should spend 1.4 minutes screening the question, drop the question if the question appears to take more than 5.7 additional minutes to finish. In this fashion, the candidate can screen 60 questions and answer 43 of them. The second block in the table says a part 2 candidate with speed of 7 minutes per question (answering 26 out of 50 in 3 hours) can improve to answering 36 questions by screening a question for 1.7 minutes and drop it if it takes more than 6.7 additional minutes to finish. The third block says a part 3 candidate with speed of 11 minutes per question

## Moving On     *(Continued from page 4)*

(answering 22 out of 40 in 4 hours) can improve to answering 29 questions by screening a question for 2.9 minutes and drop it if takes more than 10.7 additional minutes to finish.

| $1/\lambda$ | $1/\beta$ | Best $\tau$ | $\phi(\tau)$ | Answers | Screens |
|---|---|---|---|---|---|
| 1 | 5 | 5.67882 | 3.78629 | 47.54 | 70.03 |
| 1.38156 | 4.61844 | 5.70953 | 4.22818 | 42.57 | 60.00 |
| 2 | 4 | 5.76326 | 4.83279 | 37.25 | 48.80 |
| 3 | 3 | 5.85811 | 5.52741 | 32.57 | 37.96 |
| 4 | 2 | 5.94892 | 5.89510 | 30.53 | 32.17 |
| 1 | 6 | 6.67105 | 4.22002 | 42.65 | 63.56 |
| 1.68646 | 5.31514 | 6.71743 | 5.01785 | 35.87 | 50.00 |
| 2 | 5 | 6.74025 | 5.33670 | 33.73 | 45.56 |
| 3 | 4 | 6.81814 | 6.15130 | 29.26 | 35.75 |
| 4 | 3 | 6.89973 | 6.67685 | 26.96 | 29.26 |
| 1 | 10 | 10.6555 | 5.92494 | 40.51 | 61.80 |
| 2 | 9 | 10.6953 | 7.18923 | 33.38 | 48.01 |
| 2.90466 | 8.09534 | 10.7345 | 8.16936 | 29.38 | 40.00 |
| 3 | 8 | 10.7388 | 8.26364 | 29.04 | 39.31 |
| 4 | 7 | 10.7858 | 9.15024 | 26.23 | 33.38 |
| 5 | 6 | 10.8357 | 9.85256 | 24.36 | 29.15 |
| 6 | 5 | 10.8867 | 10.37540 | 23.13 | 26.09 |

In this note, we demonstrated mathematical modeling using tools covered in the part 3 syllabus. Indeed, we have used the simplest model that gives an adequate representation. (See Miller, R., and Wichern, D., Intermediate Business Statistics, Holt, Rinehart and Winston, 1977, p. 380.) Note that the simpler model of T distributed exponentially·would not work because the exponential distribution is memoryless. (See Hiller, F., and Lieberman, G., Introduction to Operations Research, 3rd ed., Holden-Day, 1980, p. 409-410.)

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## GOLDEN ANNIVERSARIES

Congratulations to 8 Fellows and 5 Associates who this year celebrate half a century.

### Fellows

| | |
|---|---|
| Stuart F. Conrod | Jaywood Lukens |
| Gilbert W. Fitzhugh | Charles F. B. Richardson |
| Victor E. Henningsen | Irving Rosenthal |
| Edward A. Lew | Edward G. Schafer |

### Associates

| | |
|---|---|
| David J. Cowie | Richard J. Learson, Jr. |
| Samuel H. Huffman | Henry A. Plimpton |
| | Archibald M. Price |

The 8 Fellows are those who remain with us from 15 originally in that group. This is close to the normal 50-year survival ratio observed from past experience.

We now have 92 Fellows who have been such for half a century or more; three years ago there were 86, and the outlook is that there will be more than 100 by 1986.

The three seniors, all F.S.A. 1920, are: William P. Barber, Jr., F. Bruce Gerhard and James E. Hoskins. We note that two of these have stayed in the frigid northeast, one has settled in Florida.

## CENTURY-OLD ACTUARIAL FAMILIES

How many actuaries who practiced more than 100 years ago have descendants now in the Society?

To our knowledge the answer is Three, viz.:

Sheppard Homans, 1831-1898. Entered our profession 1855. Present member, Ronald L. Homans, F.S.A. 1976.

John Marshall Holcombe, 1848-1926. Entered 1869. Present member, Shepherd M. Holcombe, F.S.A. 1952.

Charlton T. Lewis, 1834-1904. Entered 1878. Present member, Daniel F. Case, F.S.A. 1963.

Before Douglas S. Craig died last summer, this list would have been one name longer.

Additions to or corrections in the above will be most welcome.

*E.J.M.*

## THE PACIFIC INSURANCE CONFERENCE

*by Robert D. Shapiro*

The Pacific Insurance Conference, an organization strongly supported by actuaries of Pacific Rim countries, held its eleventh biennial session in Kauai, Hawaii on September 11-16, 1983. Its theme was "Life Insurance and Diversification in the 1980's". Four major topics were covered:

1. Current developments in diversification
2. Diversification opportunities vs. regulatory restraints
3. The effect of diversification on products and distribution systems
4. Future possibilities for diversification and the management risks involved.

The first of these was largely presented through a series of national reports by representatives of the life insurance company associations in various countries; the others were presented in individual papers that were discussed on successive days.

Many diversification issues thus surfaced during morning sessions wherein the authors' views were amplified or challenged. Afternoons were devoted to smaller group workshops where discussion continued at higher focus and intensity.

The Conference gave participants excellent opportunities to learn how professionals and companies in other countries are changing in the tumultuous environment of the 1980's. Papers dealt with development of new life insurance and the search for new distribution systems. But there was rather little discussion on how such changes have reflected new corporate strategies, or what companies foresee as their next changes. Most diversification reasons appeared to be more defensive than offensive—reflecting corporate objectives to spread risk, to hedge future operations, to expand management horizons and enthusiasm, or to benefit from expected growth in financial services markets.

Fortunately, the workshops provided a forum for digging into some of the important questions that were difficult to pin down in the morning sessions. Discussions in those workshops covered not only "How are we now being changed?", but also: